

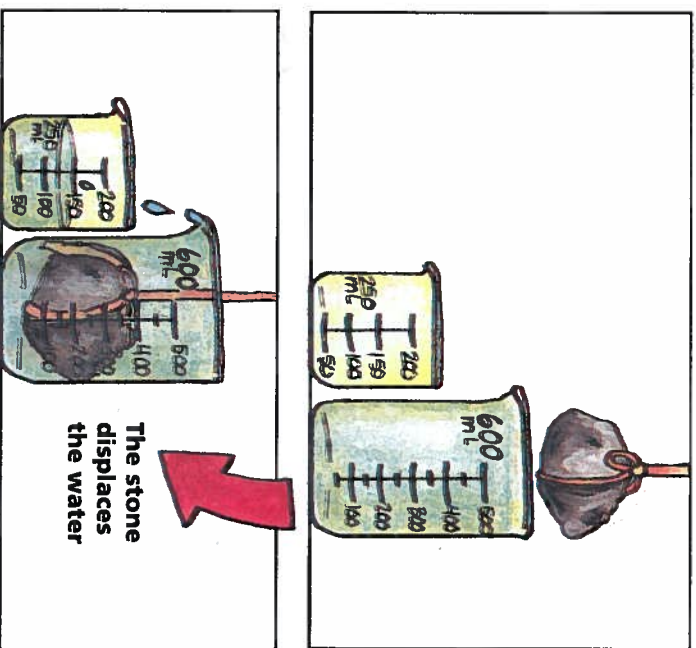
13-4 What is displacement?

Objectives ▶ Define displacement. ▶ Find the volume of an irregular solid.

TechTerm

▶ **displacement** (dis-PLAYS-muhnt): amount of water an object replaces

Displacement About 2000 years ago, a Greek scientist named Archimedes (ahr-kuh-MEE-deez) made an interesting observation. He stepped into a bathtub full of water and noticed that the water level rose. Some of the water spilled over the edge of the tub.

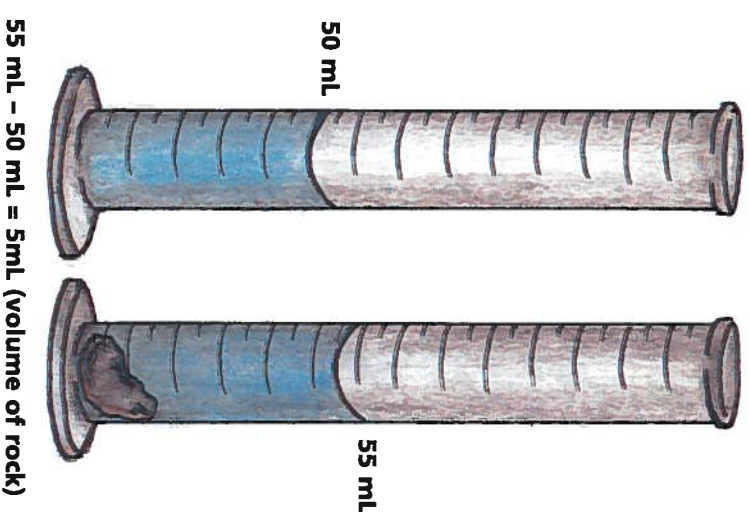


What Archimedes observed occurs whenever an object is placed in water. When objects are placed in water, they make the water level rise. The water level rises because water is pushed out of the way by the object. The amount of water that an object replaces is called its **displacement** (dis-PLAYS-muhnt).

▶ **Define:** What is displacement?

Displacement and Volume When an object is placed in water, the volume of the water that the object displaces is equal to the volume of the object. Many objects, such as rocks, do not have a regular shape. You can use displacement to find the volume of an irregularly shaped object.

To find the volume of an irregularly shaped object, pour some water into a graduated cylinder or a beaker that is marked to show volume. Record the volume of the water. Place the object into the water. Notice that the water level rises. Record the new volume of the water. The volume of the object is equal to the amount that the water level rose. Suppose a rock displaces 5 mL of water. The volume of the rock is 5 mL.



▶ **Explain:** How can you find the volume of an irregularly shaped object?

LESSON SUMMARY

- ▶ Archimedes observed that when an object is placed in water, it causes the water level to rise.
- ▶ The amount of water that an object replaces is called displacement.
- ▶ The volume of water that an object displaces is equal to the volume of the object.
- ▶ The volume of an irregularly shaped solid can be found by placing the object in water and measuring the volume of water that the object displaces.

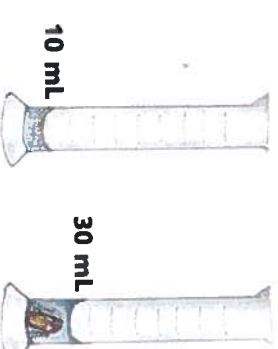
CHECK Write true if the statement is true. If the statement is false, changed the underlined term to make the statement true.

1. If an object displaces 50 mL of water, the object's volume is 50 mL.
2. When an object is placed in water, the water level falls.
3. The amount of water that an object replaces is called displacement.
4. A rock is an irregularly shaped object.
5. The mass of an irregular object is equal to the volume of water it displaces.

APPLY Complete the following.

6. **Analyze:** Does the amount of water displaced by an object depend on the object's mass? Explain your answer.
7. Why is displacement useful in finding the density of an irregularly shaped object?

Use the diagram to answer the following.



8. **Observe:** How much water was displaced?
9. What is the volume of the rock?

Ideas in Action

IDEA: You probably observe displacement everyday. When you add ice to a drink, the ice displaces some of the liquid.

ACTION: Keep a record for the next three days of all the activities you observe that involve displacement of a liquid.

ACTIVITY

MEASURING DISPLACEMENT

You will need a small rock, a golf ball, a graduated cylinder, water, and a balance.

1. Use a balance to find the masses of a small rock and a golf ball. Record your measurements in a data table.
2. Fill the graduated cylinder with water to the 50-mL mark.
3. Gently place the rock sample in the water. Notice how much the water level rises. This is equal to the volume of water displaced. Record the volume of the water in your data table.
4. Repeat Step 3 with the golf ball.

Questions

1. a. What is the volume of the rock? b. Of the golf ball?
2. **Analyze:** Does the amount of water displaced by an object depend on its mass? How do you know?

